POCKET COMPUTER NEWSLETTER

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SUPER SST

This is a program designed to run on the Sharp PC-1500 and Radio Shack PC-2 units. It is a powerful *spreadsheet analysis* program that can aid in the solving of complex problems in seconds, instead of the hours it might take using an ordinary calculator.

Equipment Needed

You need a Sharp PC-1500 or Radio Shack PC-2 pocket computer that is equipped with *at least* 8 kilobytes of additional memory (Sharp type CE-155 or equivalent memory module) so that the system has 10K of user memory. A Sharp CE-150 or equivalent printer/cassette interface and a tape cassette player is required to load the program. After loading the PC may be used with or without the printer/cassette interface.

What It Does

An accompanying illustration depicts a matrix of cells. Each cell has been identified by column and row position. Columns are labeled with the letters A - N, rows using the digits 0 - 9. Thus, the cell in the upper left-hand corner is cell A0. That in the lower right-hand corner is designated N9.

Imagine that you can place numerical values or formulas representing numerical values into any of the cell positions in the matrix. Furthermore, assume that formulas may refer to the contents (value) of any other cell in the matrix. For instance, a formula in cell position A3 might refer to values held in cell positions A0, A1 and A2 through an expression: A0+A1+A2. That is, position A3 is set equal to the sum of the values in those cells.

Remember, any position in the matrix can refer to any other location in the matrix. (Though, for reasons that will be discussed later, there are certain preferred reference rules that should be observed in order to obtain practical results.) You can fill all 140 positions in the two-dimensional array (14 columns by 10 rows) with values and formulas that reference values in cells. For instance, you could devise 139 different formulas to operate upon a particular value in the 140th position of the matrix.

You, in effect, can mimic having formulas and values *spread* all over a *sheet* of paper. You just don't need the paper any more. The whole process is handled electronically.

The net result is the saving of a lot of tedious work. Suppose you had to use pencil, paper and a calculator to solve all the equations one might arrange in a 140-cell matrix? It would sure be a lot of work, especially if formulas called upon the results of solving other formulas elsewhere in the matrix. Yet, many people have to do this type of work all the time.

Business people frequently have to perform this type of matrix analysis in order to produce future cash flow projections. Scientists and engineers set up such calculations when analyzing problems that involve multiple parameters. Even ordinary citizens meet with the need to perform a similar analysis if they attempt to plan an ordinary household budget.

Ordinarily, this type of "spreadsheet analysis" involves a lot of frustrating, time-consuming, pencil-pushing, mental or calculator-assisted arithmetic and a stout eraser!

But the drudgery of such operations can be eliminated through the use of a PC and this *SUPER SST* program. The program automatically determines the values defined by mathematical expressions within the cells of the matrix.

Do you want to see the results of manipulating a data value 139 ways? OK, enter 139 different expressions referencing that data value. Each expression goes in a separate cell position in the matrix. Enter the data value into the 140th location. Touch a button on your PC and in a matter of minutes your PC will give you the results of 139 different calculations! Want to see what happens if the data value is altered? No problem, change the single data location and have the PC calculate the new values.

Getting Started

The first step towards using *SUPER SST* is to load the program into your PC. This is accomplished using the steps presented next. It is assumed during the following description, that your PC is properly

Figure *A Spreadsheet Arranged as 14 Columns (A – N) by 10 Rows (0 – 9).*

A0	B0	C0	D0	E0	F0	G0	H0	I0	J0	K0	L0	M0	N0
A1	B1	C1	D1	E1	F1	G1	H1	I1	J1	K1	L1	M1	N1
A2	B2	C2	D2	E2	F2	G2	H2	I2	J2	K2	L2	M2	N2
A3	B3	C3	D3	E3	F3	G3	H3	I3	J3	K3	L3	M3	N3
A4	B4	C4	D4	E4	F4	G4	H4	I4	J4	K4	L4	M4	N4
A5	B5	C5	D5	E5	F5	G5	H5	I5	J5	K5	L5	M5	N5
A6	B6	C6	D6	E6	F6	G6	H6	I6	J6	K6	L6	M6	N6
A7	B7	C7	D7	E7	F7	G7	H7	I7	J7	K7	L7	M7	N7
A8	B8	C8	D8	E8	F8	G8	H8	I8	J8	K8	L8	M8	N8
A9	B9	C9	D9	E9	F9	G9	H9	I9	J9	K9	L9	M9	N9

equipped with at least an 8K memory module (giving a minimum of 10K total user RAM) and that your PC is mounted on a printer/cassette interface in preparation for reading the program in from the tape cassette on which it is supplied.

1. Place the PC in the PRO mode and issue the following command:

NEW &4000

(This is a special command with which you may not be familiar. It is used here to allocate memory into two sections. One for holding the special machine language routines used by this program. The other for the BASIC portion of the package.)

2. Install the program cassette in your tape unit. Make sure it is rewound to within a few turns of the start of the tape. (The program is recorded on both sides of the tape, so you may use either side.) You may ascertain that it is properly positioned by doing the following: Remove the plug from the "earphone" (output) jack of the recorder so that you may listen to the tape. Place the unit in the "playback" mode. Listen until you hear the voice announcement *"SUPER SST"*. Immediately following the voice announcement you will begin to hear a high pitched tone. Stop the tape unit at this point. It is properly positioned to begin loading the program. Make sure you re-insert the plug from the interface back into the "earphone" (output) jack of the tape machine.

3. With the program cassette properly positioned, enter the special tape command:

CLOAD M

(This command is used to load in the machine language portion of the program.) Make sure that the tape recorder is in the "playback" mode and that the tape begins to move as soon as the ENTER key (used to execute the command) has been pressed. You should then hear a tone from your PC as the tape is being read. About 5 to 10 seconds after starting the tape, you should see the message:

SSTMLF

appear on the display. If nothing appears on your display after the first burst of data has been heard, then the tape is not being read properly. You may have to adjust the tone and volume controls to obtain proper loading.

> NOTE: The tape cassette on which this program is supplied is prepared by specially-designed digital high speed duplicating equipment. You may have to set volume and tone settings different than you normally use for tapes procuced on your recorder. We appear to obtain best results, when using a Radio Shack Minisette-9 recorder, with the volume up in the range 7 to 9 and the tone down in the range 0 to 5. These settings may be different on your unit. However, regardless of the recorder being used, if you do not see the program title come up within about 10 seconds (immediately following the first burst of data), then the program will not load properly. Stop the unit, reposition the tape back to the beginning, and change the volume and/or tone controls to a new setting before trying again.

4. Allow several minutes for the SSTMLF section of the tape to be loaded into your PC. At the conclusion of a normal tape read operation, the display will show the usual prompt (>) sign. Now enter the regular tape read command:

CLOAD

to load in the next section of the tape. Within about 10 seconds you should see the message:

SUPER SST

appear on the display, indicating normal tape loading. Allow 5 to 6 minutes for this section of the program to load. Upon completion of the program loading process, the display will again show the usual prompt (>) sign. *SUPER SST* is now residing in memory and is *almost* ready for use.

While *SUPER SST* is provided on both sides of the tape cassette, many people feel safer when they make a backup copy of the program for everyday use and save the original tape as a "master". Should you desire to make such backup copies *for your own personal, archival purposes*, then insert a fresh cassette into your recorder and issue the following commands:

CSAVE M "SSTMLF"; &38C5, &3FFF
CSAVE "SUPER SST"

(allowing the first to be completed before issuing the second). We hope that you will appreciate our stance in not "locking" the program so that you may have the security of backup copies. Your respect of our copyrights will serve as encouragement for us to release additional powerful software packages in similar fashion. Should we find that our copyrights are not being respected, future releases will employ various kinds of protective measures that would make such backup copies difficult to produce. Should you learn of anyone violating our copyrights and can document such infringement, please let us know.

The next step is almost as important as loading the program. You *must* set up one of your DEFINABLE "softkeys" to contain the directive: GOTO 1@. Note the use of GOTO and *not* RUN. This is very important for reasons that will be mentioned soon. If you have not previously had experience setting up your "softkeys," I would suggest you review the appropriate section in your PC's instruction manual. Closely adhering to the following steps should help you accomplish the desired setting up of a softkey.

Setting Up A Softkey

This procedure assumes that you have not previously defined functions or assigned operations to your unit's softkeys. (If you have, then you know enough to set up a softkey that is currently unassigned!)

1. Press the SHIFT key and then the MODE key. Observe that the RESERVE annunciator comes on in the upper right-hand portion of the liquid-crystal display (LCD).

2. Slightly to the right of the RESERVE annunciator in the LCD is another annunciator that appears as the Roman numerals I, II or III. Set this annunciator to I by using the Reserve Select key (labeled ◇ on the keyboard and positioned just to the left of the key labeled RCL).

3. Now depress the left-most softkey at the top of the keyboard. (The one that has the exclamation (!) character right above it.) Observe that "F1:" appears on the LCD.

4. Use the keyboard to type in: GOTO 1@ — note that the @ symbol is obtained by pressing the SHIFT key and then the "equals" (=) key.

5. Now press the ENTER key. The LCD should still show:
F1: GOTO 1@

6. Press the key labeled RCL (the "recall" button). The LCD will turn blank.

7. Use the keyboard to type in: "GO1"

8. Press the ENTER key and observe that GO1 (without the quotation marks, now) remains on the LCD.

9. Press the MODE key to return the PC back to its normal RUN or PRO mode.

Congratulations! You have set up a softkey to contain the directive GOTO 1 with automatic execution of that command when the key is pressed. That was easy, right? So is operating SUPER SST.

Ready To Go

The best way to become familiar with the operation of the program is to actually use it as examples are discussed.

Place the computer in the RUN mode. Make sure that the Reserve Status selector is set to I, then press the softkey that you previously labeled "GO1." The first time this is done after the program has been loaded into memory, you will see the LCD flash the three-part message:
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Then you will observe the message INITIALIZING SPREADSHEET flashing on the display. This signifies that the arrays used by the program are being cleared so that you effectively begin operation with a "clean" spreadsheet.

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This is the only time that the spreadsheet will be automatically cleared. From now on it will take a specific (verified) directive from you in order to clear the spreadsheet. You may turn you PC off or on, use other programs or perform calculations (with certain limitations that will be explained shortly), and perform all of the various spreadsheet options without disturbing the data placed in the *SUPER SST*'s arrays! Thus, the program and data can remain constantly available for your use, yet the PC is still able to serve other functions.

After the "initializing spreadsheet" message has disappeared, you will see the program's primary menu appear on the display:

DEF LBL DIS I/O PRT CLR

Each option in the menu is located above a softkey.

To satisfy your initial curiosity and give you a feel for the kind of program you are dealing with, press the softkey labeled DIS. The query:

RECALCULATE (Y/N)?

will appear. Press the N key and then the ENTER button. When the query:

ROW (#) OR COLUMN (LTR)?

comes up, press the letter A on the keyboard. The message:

COLUMN A - ROW (0-9)?

will then appear. Press the digit 0 on the keypad. Presto! You will see the information:

A0 RSLT:* -999,999,999.90

appear on the LCD. Know what it is telling you? Sure, position A0 in the matrix contains the value -999,999,999.90. That is the value that is displayed if no data value has been entered in a cell (or if there is an error condition so that it is not possible to obtain a valid result in that position).

Scanning the Spreadsheet

When *SUPER SST* is in the DIS (display) mode, it is effectively serving as a "window" to the cells of the entire spreadsheet. You can examine any cell in the matrix by effectively scanning across (right or left) or up and down the sheet. To accomplish this you use the cursor and scroll keys.

For instance, try pressing the key marked > (cursor-right). The display will blink and you will see that the cell position (identified at the extreme left-hand end of the LCD) has changed to B0 (from A0). Press the cursor-right key again and cell C0 is displayed.

Now try the cursor-left (<) key and see what happens. Then the scroll-down (v) and the scroll-up (^) keys. Neat, eh? Notice that if you try to scan or scroll outside the bounds of the spreadsheet, the directive is simply ignored.

If you have not already (accidently or otherwise!) done so, try pressing any other button on the keyboard. See what happens – the program goes back into its primary menu selection mode.

Inputting Data

SUPER SST is always actually simultaneously handling two matrices. One is the *results* matrix, the other is referred to as the *data* (input) matrix. The latter holds the actual formulas or raw data values. In order to get results showing up on the LCD when the DISplay mode is selected, you first need to set up data using the DEF (define) option.

To see how this is accomplished, press the softkey labeled DEF when the primary menu is being displayed. You will immediately see the query:

ROW (#) OR COLUMN (LTR)?

This means the program wants to know if you would like to enter data (information) going *down a column* or *across a row.* The first character you enter in response to this query determines your selection.

If you strike any letter from A through N, then you will be entering data going down the column that has that letter designation.

If you strike any digit, then you will be entering data going across the row that has that numerical designation.

For the sake of illustration, press the letter A in response to the query. The LCD will respond:

COLUMN A - ROW (0-9)?

Notice that this signifies that column A has now been selected, so you will be inputting data going down a column. But, the program wants to know where in that column – at which row number – you want to begin? For illustrative purposes, enter the digit 0 at this time. The display will now change to:

A0 DATA?

The program is indicating it is ready to accept data at cell position A0. If you now press the digit 1, you will see that value appear in the LCD.

Did you hold the digit 1 key down too long? If you did, you will see the value 11 or 111 or even 1111 (and more!) appear in the display.

At this point the program goes into a special input mode (using the INKEY$ function) that scans the keyboard in order to accept inputs to the data matrix. You may notice that it seems to take a fraction of a second longer than usual for the display to reflect the pressing of a key. This is normal when the program is in this mode. You will also find that holding a key down causes the character to be repeated. Sometimes you may accidently hold a key down longer than desired and find that the character has been entered several times. No problem. You can erase characters when in this mode just by pressing the cursor-left (<) key. Not only will the cursor back up, the characters previously entered will actually disappear.

OK, make sure that just the number 1 is entered as data at the current position (A0) and press the ENTER key. There will be a barely perceptible pause while the program checks to see that the entry is in a valid format. If the entry was not valid, then the message:

WHAT WAS THAT?!?

would be displayed briefly. You would then be given the opportunity to re-enter the data.

When the input is acceptable, the program places it in the data matrix and automatically advances to ask for the next cell's data. That is, it proceeds down a column or across a row *according to the convention you originally selected.* In this example, where we are going down a column, the LCD will show:

A1 DATA?

Notice that now the matrix location is at row 1 in column A instead of row 0.

Try entering the value 2 at this matrix position (A1) and press the ENTER key to conclude the operation.

When:

A2 DATA?

appears, enter the *expression:* A0+A1. This will tell the program that the value you want to use in A2 is the sum of the values contained in the cells at A0 and A1. Press the ENTER key after typing the expression to conclude the input operation.

X Means Terminate

You now know that *SUPER SST* automatically advances to the next cell position when data is being entered. It will do so until it reaches the end of a column or a row. There may be times, however, when you do not want to fill all the cells in a column or row.

OK, all you have to do to get back to the primary menu is to enter the character X and press the ENTER key. Got that? Just the single letter X *and nothing else* as a "data" entry and press the ENTER key. The cell position being accessed will remain unaltered and the program will immediately exit the DEF mode and return to the primary menu.

If you have been performing the example entries to this point, your display will currently be showing:

A3 DATA?

Enter the letter X and press the ENTER key. It is time to see the fruits of your initial labors!

Back to the DISplay Mode

When the primary menu is back on the LCD, press the softkey labeled DIS. Answer the initial query:

RECALCULATE (Y/N)?

in the affirmative by pressing the Y (yes) key and then the ENTER button. You will soon see the message:

CALCULATING A

come up on the LCD. Soon the message will start expanding, a character at a time, until eventually it appears as:

CALCULATING ABCDEFGHIJKLMN

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If you listen closely, you will also hear a slight ticking sound coming from your PC. No, it has not been turned into a time bomb (unless the data you are working with is potentially explosive). It is simply telling you that it is working on evaluating all the data in the spreadsheet.

Each time it starts to analyze a column of data, the letter used to designate that column appears on the LCD. A fully utilized matrix is typically recalculated in 10 to 12 seconds. If the matrix contains a great many complex expressions, the recalculation time may take 15 to 20 seconds. The status of the display gives an indication of how far along a calculation is at any time.

When the entire matrix has been recalculated, a brief three-note audible signal is generated. The program is then ready to display the new results. Now the query:

ROW (#) or COLUMN (LTR)?

will appear on the LCD. This signifies that the program needs to know the matrix position at which you wish to start viewing the results of the calculations. For illustrative purposes at this point, try entering the column designation A. The liquid-crystal display will now change to:

COLUMN A - ROW (0-9)?

Enter the digit 0. The screen will show:

A0 RSLT:* 1.00

That is simply the data value originally inputted (when in the DEF mode) for that position.

Now press the scroll-down key (v) and observe:

A1 RSLT:* 2.00

Again, this is just the data value inputted at that location.

Finally, press the scroll-down key one more time to view:

A2 RSLT:* 3.00

Remember, that was the position that held the expression A0+A1. Do you see how the system works?

You may, of course, continue using the cursor and scroll keys to scan the rest of the current "results" matrix. However, if you have been following the example steps to this point, all of the other cells still contain the initializing value of -999,999,999.90 as nothing has been defined in those locations.

To return to the primary menu, just press any key other than the cursor or scroll buttons.

Editing Data

Now that you have a basic idea as to the capabilities of the program, it is time to go back and learn a few of its finer points. The process of demonstrating by example will be continued.

Once again, assuming you are in the primary menu selection mode, press the softkey under the DEF label. Enter the letter A and then the digit 0 as responses to the next two queries. If the data from the earlier example is still in place, the LCD will now show:

A0 DATA? 1

That is, the cell at position A0 holds the data value 1.

SUPER SST provides several editing options when in the data input (DEF) mode. These options are described next.

You Can Leave It Alone

You can simply review the contents of cells. If you are satisfied with their values, simply press the ENTER key *and nothing else.* The current contents of that cell will thus be left alone.

You Can Erase It

If you want to return a data cell to the initialized (blank) state (which will result in -999,999,999.90 being displayed when viewing the results matrix), then you press the minus (-) key and then the ENTER button.

You May Enter New Data

If you do not like the data value or expression currently in a cell, then just start typing in new data. The new information supercedes previous data *as soon as the ENTER key is pressed.* (Since the old data is not replaced until the ENTER key is used, it is possible, for instance, to start entering a new value, decide you want to stay with the earlier one, use the cursor-left key to erase your current entry and press the ENTER button. This operation would have the same effect as just pressing the ENTER key as described above – the original contents of the cell would be left unchanged.)

X Still Terminates

Pressing the X key and then ENTER *with no other input* causes the program to return to the primary menu.

You Can Go Across a Row

When the DEF mode is entered, the first query is:

ROW (#) OR COLUMN (LTR)?

You already know that responding with a letter from A to N means data will be entered going down the corresponding column. If, instead, you respond to this initial query with a digit from 0 through 9, you will be able to enter data going across the corresponding row. In this case the program needs to know at what column in the row you want to start entering information. If, for instance, the digit 0 was initially inputted, the program would respond with:

ROW 0 - COLUMN (A-N)?

You would pick the desired column at which to start inputting in that row. Now, as each cell was filled, the row number would hold steady and the column indicator would change. (As, for example, A0, B0, C0,..., N0.)

Restrictions

Has anyone ever designed a program without a few restrictions?

When entering data, values should not exceed 10 significant digits (the limitation of the PC).

SUPER SST was designed primarily as an aid in performing financial spreadsheet calculations. Thus, it rounds displayed results to two decimal places (dollars and cents format). However, internal results are maintained to ten decimal places.

Some users may desire other types of display formats other than dollars and cents. This may be customized by altering the USING statement in lines 6130 and 7000 and modifying the rounding statement in lines 4125 and 6170.

You will soon discover, if you have a penchant for creating long mathematical expressions, that the maximum number of characters permitted in an expression is 16. When you reach the end of the display in the DEF mode, that is the end of your expression. Period.

There Are Six Valid Mathematical Operators

These may be used in formulas as follows:

- \- *minus symbol:* This is the subtraction operator. It may also serve as the unary minus sign. *It is the only operator that may also be used as a unary sign.*
- \+ *addition symbol:* May be used exclusively for the purpose of indicating the addition operation. *It may not be used as a unary (positive) sign.*
- * *multiplication symbol:* Used strictly to indicate multiplication.
- / *division symbol:* Signifies division. Attempting to divide by zero results in the output appearing as the default error value which is -999,999,999.90.
- () *parentheses:* May be used to group operations, thus establishing mathematical precedence.
- = *summation indicator:* This is a special operator used to indicate a summation process across a row or down a column. This operator may only be placed between two valid matrix coordinates. Only one parameter (row or column designator) may be varied within such an expression. The terminating coordinate must be to the right or below the initiating coordinate. Thus A1=A5 and A1=E1 would be valid specifications, while A1=E5 (both column and row parameters vary) or A5=A1 (terminating row coordinate is above the initiating row) would be invalid. Put another way, summations may only be specified horizontally or vertically, going from left to right or top to bottom.

Mathematical Precedence

SUPER SST always performs calculations according to the following precedences:

- = Summations are always performed as encountered. Since this operator must be preceded and followed by a matrix coordi-

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nate, no other operator (such as a parenthesis) is allowed to influence this procedure.

() Parentheses have effectively the highest pure operator precedence. All operations within a pair of parenthesis are performed before further calculations take place.

*,/ Multiplication and division have equal precedence and are performed before addition or subtraction.

+,- Addition and subtraction have lowest, but equal, precedence.

Only parentheses may directly encounter the operators +, -, * or /. With the exception of parentheses, mathematical operators must be separated by data values or symbols (matrix coordinates). All values are considered positive unless preceded by the unary minus sign. It is valid to specify -(-1), but not --1.

Syntax Checking

Data inputs are checked for syntax errors. Unacceptable inputs are discarded with the message WHAT WAS THAT?!? being displayed. Data must then be re-entered.

Note that only syntax is checked. Improper operations such as division by zero or invalid coordinate relationships in summation operations are detected only when in the DIS mode (during a recalculation). Such errors cause the "minus nines" (-999,999,999.90) result to be displayed at affected locations.

Up and to the Left

When referencing positions in the spreadsheet, it is always best to refer to positions that are above and/or to the left of the current cell. Thus, if you are creating an expression in cell B7, it is suitable to reference any cell in column A (because the entire column is to the left of column B). It would also be OK to reference cells B0 through B6 (as they are directly above cell B7). It would not generally be wise to reference cells B8 and B9 in this instance (as they are below cell B7), nor any cells in columns C through N (as they are to the right of column B).

The reason for making this recommendation is because of the direction in which the program proceeds to analyze a spreadsheet. It always analyzes the expressions in a matrix by proceeding down columns and doing each column in turn from left (A) to right (N). If, when evaluating an expression, the program encounters a reference to a cell that has not yet been processed, it will simply insert the default error value (-999,999,999.90) at the current cell position. It then makes electronic note of the fact that the program needs to make another "pass" through the matrix as it was not able to completely evaluate an expression on the current pass. Such additional passes are time consuming.

Furthermore, forward references of this nature can lead to situations where the matrix can never be completely solved. The best advice is to arrange spreadsheets so that references to other cell positions are always to those cells that will have been evaluated when the referencing expression is encountered.

More About the DIS Mode

Whenever the DIS (display) mode is selected (through the primary menu) the program checks to see if a recalculation of the matrix should be made. Theoretically (in order to handle all possible cases) a recalculation of the matrix should be made if: 1. There was any change in the result of any cell during the last recalculation, and/or 2. The user has altered any value using the DEF mode.

If a recalculation (theoretically) should be made, the user is notified of the condition by the query:

RECALCULATE (Y/N)?

This allows the user to choose not to perform a recalculation, if desired.

Why allow this choice? For practical considerations. First of all, the recalculation of a matrix wherein all 140 cells contain complex expressions can take a number of seconds. There are times – easily recognized by experienced users – where a recalculation will not result in any changes in the results. In such cases, the user will generally not want to bother waiting for a recalculation.

As a specific instance, if a user knows that a matrix does not contain any forward references, then it is only necessary to process the array one time. However, in order to handle the general case, the program is designed to process such a matrix twice as it looks for the condition where there is no change in the results of any cell in the matrix during a complete scan. *This condition will only occur on the second pass as during the first pass all cells are changing from the initialized (minus nines) condition to the actual results!* Thus, after the first pass the program will be flagged to perform another pass, but the user who knows there are no forward references in the spreadsheet can choose not to perform the recalculation.

The option to delay a recalculation can also be handy after a user has made alterations to data without first writing down (or printing) the previous results. In this situation, the recalculation process can be circumvented until the earlier values have been appropriately reviewed and/or recorded.

If a theoretical recalculation is not needed, then the recalculate option is not proferred to the user.

Look Wherever You Want

When the display mode query:

ROW (#) OR COLUMN (LTR)?

comes up you are simply being given the opportunity to start viewing the results matrix at any cell location. If you input a letter (in the range A – N), the next query will be for a row number. If you enter a digit initially, then the following query is for a column (letter) designation. The net result is the specification of a cell coordinate at which to begin examining results (A0 – N9).

After the first cell has been displayed, all further scanning of the results matrix is accomplished using the cursor and scroll keys. Holding these keys down results in rapid scanning of the matrix. Striking any other key returns program control to the primary menu.

Any cell containing the value -999,999,999.90 means that either there has been no data inputted at that cell position, that there is an error condition at that location (such as an attempt to divide by zero) or that there was a forward reference to a cell that did not yet contain a valid numerical value (other than minus nines) in the results matrix, when the element was processed.

If there is an asterisk showing in the display such as indicated here:

A0 RSLT:* 1.00

it means that theoretically the array should be recalculated. The lack of an asterisk indicates that the array has been processed to stability. (Two passes through a matrix that does not contain any forward references or input changes is all that it takes to reach this condition. Try it sometime.)

Outputs Only Affect Outputs

Outputs can never alter inputs. Remember, there are actually two matrices being processed by the program. One, the input array, is used to enter values and define expressions. The cell positions referenced in these expressions are those of the output matrix. Thus, an expression that refers to cell A1 is really specifying the numerical value contained in the results matrix at that location. It does not refer to the input matrix which may, indeed, itself contain a complex expression.

Results change as a consequence of recalculations. The expressions or data values entered in the DEF mode are not affected by recalculations in the DIS mode!

Hardcopy Capability

The LCD on the PC provides a convenient viewing window onto the spreadsheet for purposes of inputting data and scanning results. However, there will undoubtably be times when you would like to study results in depth, as well as applications where you want to maintain a permanent record of information.

The softkey labeled PRT provides the capability to print copies of both the data matrix and the results matrix. When this option is first selected, the query:

DATA OR RESULTS (D/R)?

appears on the display. Respond with the letter D and press the ENTER key to obtain a listing of data values and expressions currently in the input matrix. (Of course, make sure your printer unit has paper and is ready to operate before issuing this directive.)

Next the program will ask:

STARTING ROW (0-9)?

You may specify any range of rows. To do all the rows in a spreadsheet, you would specify 0 as the starting row and respond with 9 to the next query:

ENDING ROW?

Notice that you may specify just a single row (by indicating the same row as the starting and ending point) or any block of rows, such as 3 through 6.

You then enter the same type of information for the columns that your want printed when the computer queries:

STARTING COLUMN (A-N)?

and

ENDING COLUMN?

Here, you would specify columns A through N if you wanted the entire spreadsheet displayed.

The program will then output the portion of the spreadsheet that you have requested. Note that the information is printed "sideways" on the tape so that an entire spreadsheet can be viewed on a single strip of paper.

If you respond with the letter R (instead of D) to the initial query (for data or results) then the program will give you a hardcopy of the current results matrix.

If an asterisk (*) is printed in the extreme upper left-hand corner of the output, then it means that theoretically the spreadsheet should be recalculated, just as it does when in the LCD display mode.

By the way, as will be described in the next section, *SUPER SST* can print row and column labels as well as a title for the spreadsheet! Thus you can have all of your information neatly summarized in a format that is easy to read and comprehend.

At the conclusion of the printing operation the program returns to the primary menu.

Assigning Labels to a Spreadsheet

To assign labels (and/or a title) to your spreadsheet, for use when information is outputted to the printer, select the LBL option when the program is in its main menu mode. This will result in the query:

ROWS OR COLUMNS (R/C)?

appearing. Input the letter R if you want to label rows. Use C if you want to label columns.

If, for example, you selected R to label rows, you would then see the prompt:

ROW 0

come up on the LCD. You may now enter up to an 8-character alphabetical (or numeric) identifier for this row, such as SALES or VOLUME. The inputting mode is similar to that used when in the DEF (define) mode. To erase characters use the cursor-left key. Press the ENTER key to input the completed label. When a row has been labeled, the program automatically advances to the next row. If you want to leave the current label undisturbed, simply press the ENTER key. If you desire to terminate the labeling process, input X followed by the ENTER key.

When all the rows have been labeled, the program will provide an opportunity for you to assign a title to the overall spreadsheet by presenting the prompt:

TITLE:

A title may contain up to 14 characters and is entered in the same manner as that used to input labels.

If you select C for labeling columns, then the program proceeds in a similar fashion to allow you to label each column.

After labeling of either rows or columns, the program automatically returns to the main menu. (Note that you must select the LBL option twice in order to completely label a spreadsheet by both rows and columns.)

You may return to re-label rows or columns at any time by selecting the LBL option. Previously assigned labels will be displayed at their appropriate positions. You may then elect to keep the current label (by just pressing the ENTER key), blanking out the label (by entering a minus (-) sign and pressing the ENTER key) or typing in a new label.

Saving Your Work

It can take just a few moments to input data values and expressions for a small spreadsheet problem. On the other hand, it might take a good part of an hour to enter a large number of expressions and perform a complex analysis. Many spreadsheet applications are of a type that call for review and updating from time-to-time. Take heart, it is not necessary to set things up from scratch every time you want to take another look at a previously defined spreadsheet.

You can save the data and results of your spreadsheets at any time via the cassette interface. You start this process by selecting the I/O softkey from the primary menu. When this is done, the program will ask:

FILE NAME?

If you are planning to save a spreadsheet for the first time, think up an applicable name (limited to 16 characters). Enter this on the keyboard, then press ENTER. The LCD will then ask:

LOAD OR SAVE (L/S)?

To save a spreadsheet on a tape cassette, respond to this query with the letter S. Make sure the tape recorder is connected properly, that a suitable cassette is installed and that the tape machine is in the *record* mode. Now press the ENTER key on the PC. Allow about four minutes to save a spreadsheet. When the tape writing operation has been completed, the program will return to the primary menu.

It is probably a good idea to record critical spreadsheets twice – and on separate cassettes. Remember, simply recording twice on the same cassette will not help if the tape breaks or is otherwise damaged.

Restoring a Spreadsheet from Tape

To continue working with a spreadsheet that was previously saved on a cassette, select the I/O option from the primary menu. When the:

FILE NAME?

query comes up, enter the file name originally used to store the spreadsheet. Respond to the:

LOAD OR SAVE (L/S)?

query with the letter L. Set the recorder to the playback mode, make sure the proper cassette is loaded and that recorder-to-computer cables are connected. Now press the ENTER key on the PC. The spreadsheet will automatically be loaded back into memory. *Remember that this process will over-write any spreadsheet currently in the PC!*

When the spreadsheet has been restored, the program will return to the primary menu. You may then pick up operations where you left off by reviewing, entering updated data values, performing recalculations and so forth.

You can save the updated version. You might want to assign it a new file name and store it on a different tape so that you maintain an archive of versions in chronological order.

Clearing a Spreadsheet

The last option in the primary menu is labeled CLR. This provides for clearing the contents of the spreadsheet to the unused (initialized) condition.

When this option has been selected it must be "authenticated" or verified. After all, you do not want to accidently erase a spreadsheet. Thus, the first thing that happens when this option has been chosen is for the program to query:

INITIALIZE (Y/N)?

If you wish to confirm that you want the present spreadsheet cleared (erased), then you must press the Y key and then the ENTER button. Upon doing so, the program will flash the copyright notice and then the message:

INITIALIZING SPREADSHEET

If the command is not confirmed, then the clearing directive is ignored. The program simply returns to the primary menu.

Shutting It Off

Whenever the primary menu is being displayed the computer is actually in the BUSY state as indicated by the BUSY annunciator in the upper left-hand corner of the LCD. Do not be fooled into thinking that your PC will automatically power-down if left unattended in this mode.

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When you wish to shut your PC off after using *SUPER SST*, return to the primary menu, press the BREAK key and then the OFF button. That way you will always be sure that you did not interrupt a spreadsheet calculation or leave an incomplete data entry which might cause problems if you attempted to resume operations later.

Restarting

Provided that you have left the program in the recommended manner (as described in the preceding paragraph), you may restart the program at any time using the directive GOTO 1. (As suggested earlier, if you have this statement programmed on a softkey, then restarting may be accomplished merely by pressing the appropriate button!)

Never, however, restart the program with a RUN command unless you also want to start with a clean (erased) spreadsheet. The RUN directive clears the arrays used by the program. The GOTO directive does not. Thus, it is the recommended restart directive. Use the CLR option provided in the primary menu when you want to erase an old spreadsheet.

Interruptions

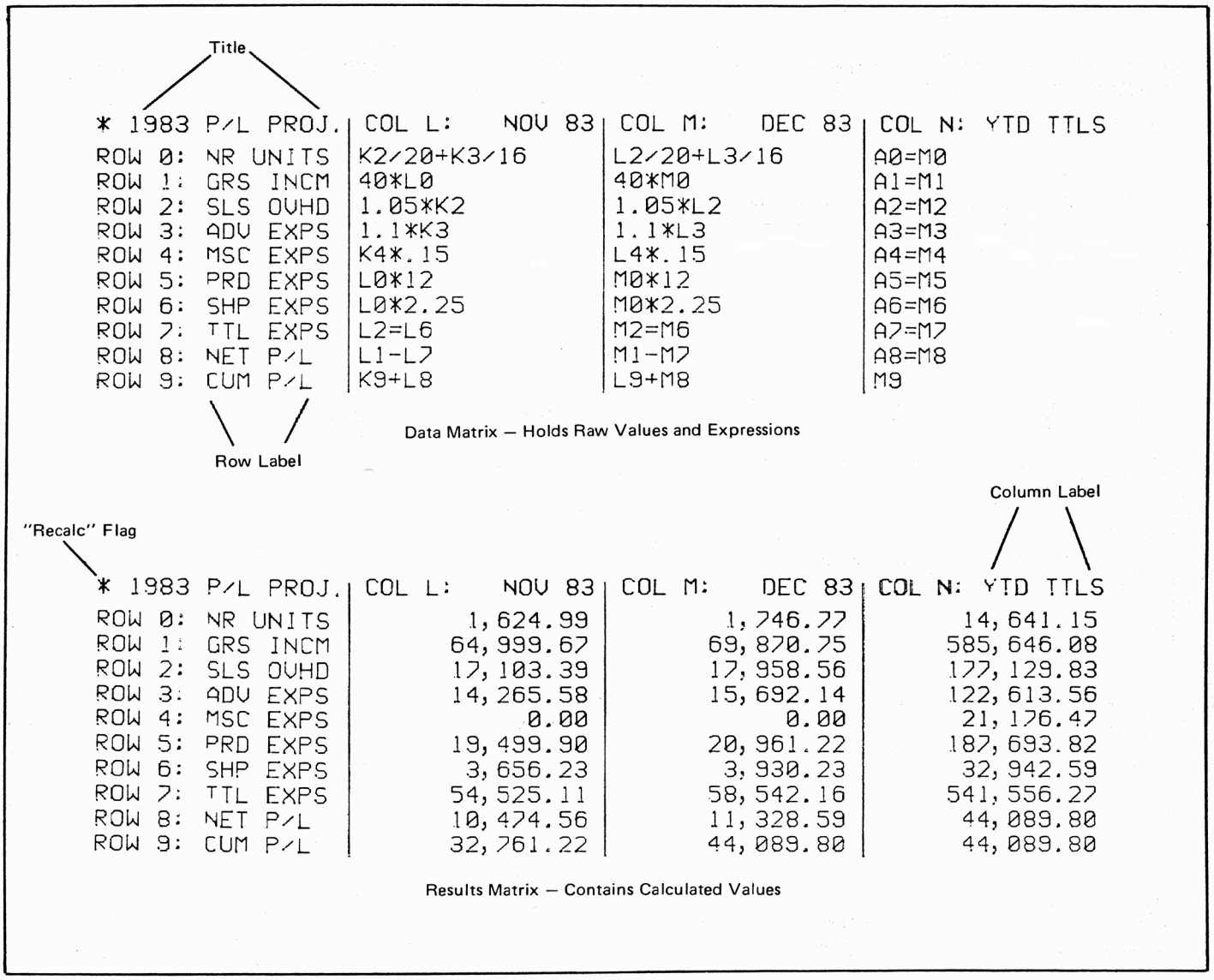
Do not use your PC for other purposes if you have a spreadsheet in memory that you want to continue using. Doing so could alter some of the variables used by *SUPER SST* thereby resulting in loss of your spreadsheet data and/or results.

However, if you are not concerned about the preservation of the current memory-resident spreadsheet, then it is OK to use your PC for other purposes. After such other usage you should make sure that you restart *SUPER SST* with a RUN directive. This insures that all variables used by the program will be properly initialized. (It also, as previously mentioned, clears out the spreadsheet storage area.)

Send in Your Program Registration Card

SUPER SST is a powerful program package representing *several thousand* hours of software engineering. No single operating manual can begin to provide all of the operating and application tips its many users may desire. Thus, to support the product, a special newsletter, *SUPER SST UPDATE*, will be published *exclusively for the benefit of validated, registered owners.* You must return the registration card containing the serial number of your tape in order to qualify for this publication. Properly registered owners will receive the first four issues of this publication FREE OF CHARGE! Register now, while you are thinking about it, to be sure that you receive additional, timely information about this powerful software tool!

Example Outputs Produced by *SUPER SST.*



* 1983 P/L PROJ.	COL L: NOV 83	COL M: DEC 83	COL N: YTD TTLS
ROW 0: NR UNITS	K2/20+K3/16	L2/20+L3/16	A0=M0
ROW 1: GRS INCM	40*L0	40*M0	A1=M1
ROW 2: SLS OVHD	1.05*K2	1.05*L2	A2=M2
ROW 3: ADV EXPS	1.1*K3	1.1*L3	A3=M3
ROW 4: MSC EXPS	K4*.15	L4*.15	A4=M4
ROW 5: PRD EXPS	L0*12	M0*12	A5=M5
ROW 6: SHP EXPS	L0*2.25	M0*2.25	A6=M6
ROW 7: TTL EXPS	L2=L6	M2=M6	A7=M7
ROW 8: NET P/L	L1-L7	M1-M7	A8=M8
ROW 9: CUM P/L	K9+L8	L9+M8	M9

* 1983 P/L PROJ.	COL L: NOV 83	COL M: DEC 83	COL N: YTD TTLS
ROW 0: NR UNITS	1,624.99	1,746.77	14,641.15
ROW 1: GRS INCM	64,999.67	69,870.75	585,646.08
ROW 2: SLS OVHD	17,103.39	17,958.56	177,129.83
ROW 3: ADV EXPS	14,265.58	15,692.14	122,613.56
ROW 4: MSC EXPS	0.00	0.00	21,176.47
ROW 5: PRD EXPS	19,499.90	20,961.22	187,693.82
ROW 6: SHP EXPS	3,656.23	3,930.23	32,942.59
ROW 7: TTL EXPS	54,525.11	58,542.16	541,556.27
ROW 8: NET P/L	10,474.56	11,328.59	44,089.80
ROW 9: CUM P/L	32,761.22	44,089.80	44,089.80

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QUESTIONS & ANSWERS

What are some of the typical applications for a spreadsheet program such as *SUPER SST?*

Perhaps the most widely known and first thought of applications are those centering around financial analysis, projections and "what if" situations. For instance, businesses typically need to perform cash flow analysis based on projected sales, costs of materials, overhead, and production labor. A spreadsheet program can be a particularly powerful tool in this situation because original "before" projections can be compared with actual results. New figures can be inserted monthly, thereby leading to improved forecasting as actual experience is acquired. The use of spreadsheets actually seems to contribute towards a discipline that is highly constructive. The act of periodically updating a spreadsheet effectively forces a timely review of critical data.

However, spreadsheet analysis need not be restricted to cash flow. It can be applied to any resource that can be appropriately quantitized, such as man hours, capital resources, and raw materials. Analysis of this type of data can be used to derive information about actual or projected productivity, efficiency, return on capital, net gain or loss, and a host of other parameters. Remember that here too, a spreadsheet program can work in both a projecting ("what if") as well as a tracking mode. This provides a feedback mechanism which can be extremely effective in managing many types of activities and projects.

A spreadsheet program is also highly effective as a comparison tool. You can, for instance, input data relating to the performance of a number of individual items, then compare the performances quantitatively against each other, against the group as a whole, or against subgroups. These comparisons can range from, say, business statistics (wherein you might compare balance and operating sheets) to engineering test data (so that you could compare performances) to raw experimental data (as might be garnered by numerous scientific disciplines).

In practice, the uses to which a spreadsheet program can be applied approaches the unlimited realm of that of the computer itself. New uses are being developed and applied daily. It is truly a user programmable tool.

I don't know anything about programming in BASIC. Can I still use *SUPER SST?*

Sure you can. You don't have to know anything about BASIC programming in order to use and apply this package. The programming has been done for you. You deal strictly at the "applications" level. You merely select and input the raw data that you want analyzed. (You may also define formulas to express relationships between data in diffirent cells of the spreadsheet). The program does all the hard work of performing the calculations requested, then displays the results. You can then quickly make alterations to your data to examine the effects. It is easy – *super easy* – which is one reason we call it *SUPER SST!*

How is the program able to perform such complex analysis so fast?

Critical portions of the program – those related to performing the complex mathematical operations – have been programmed in machine language. While much more difficult to program in, than say, BASIC, this method unleashes the full processing speed of the computer. In fact, an earlier version of this package, written entirely in BASIC, took about *twenty-five times* as long to solve a typical spreadsheet!

Who stands behind the program?

SCELBI Publications, a Connecticut Corporation and a pioneering influence in the personal computing field since 1973. More than half-a-million SCELBI computer programs and programming aids are in use world-wide. SCELBI has been active in supporting users of pocket computers since their introduction in 1980 as publisher of the popular POCKET COMPUTER NEWSLETTER.

REGISTRATION CARD

SUPER SST SPREADSHEET PROGRAM

Purchaser: Richard L. Newman

Company: Commonwealth Associates Inc.

Address: 3550 Leonard Street

City: Jackson ... State: MI Zip: 49202

You must return this properly filled out card in order to be qualified to receive *SUPER SST UPDATE* and to appear on our records as a bonafide owner of our *SUPER SST* package. Only properly registered owners will be eligible to receive program support or technical assistance and to receive information pertaining to the program package.

You must provide the information requested below as part of this registration process. If we are not able to authenticate the information, the registration will be held invalid. You must return this actual card. Photocopies or facsimiles will not be accepted.

Date: December 8, 1983

Tape Serial Number: RIM630001

Where purchased: Thru 'Pocket Computer Newsletter'

Your Signature: Richard L Newman

THANK YOU FOR PURCHASING *SUPER SST!*

SUBMITTING MATERIAL TO *SUPER SST UPDATE*

If you have an interesting application or unusual use for your *SUPER SST* program and want to share your knowledge and experiences with other users, write to:

The Editor
SUPER SST UPDATE
% POCKET COMPUTER NEWSLETTER
P.O. Box 232,
Seymour, CT 06483

If you have questions that may require an answer from the editor, please be sure to include a stamped, self-addressed envelope. Topics that appear to have wide appeal to other users will be discussed in *SUPER SST UPDATE.*

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